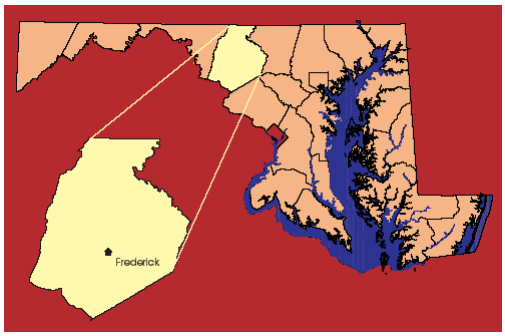
8.13 FREDERICK COUNTY



This chapter presents information about stream conditions of potential management interest in Frederick County based on the 2000-2004 Maryland Biological Stream Survey (MBSS) results. Information from MBSS data collected between 1994 and 1997 can be found in MDNR 2001k.

8.13.1 Ecological Health

Based on the three ecological health indicators used by the MBSS, the overall condition of Frederick County streams during 2000-2004 was Poor (Figure 8-96). The FIBI results indicate that 26% of the streams in the county were in Good condition, while only 2% rated Good using the BIBI. In contrast, 30% of the streams in the county scored as Poor or Very Poor using the CBI, while only 5% scored as Good and 36% scored as Fair.

Sites with Poor IBI scores were widespread in Frederick County, especially in Catoctin Creek. In contrast the sites with Good IBI scores were largely concentrated north and west of Thurmont and along the southeastern edge of the county. The highest rated stream in Frederick County using the Combined Biotic Index (CBI) was High Run, while the lowest rated streams included unnamed tributaries to West Branch, Dollyhide Creek, and Little Catoctin Creek (Table 8-25). Based on Stream Waders volunteer data, Catoctin Creek and the Lower Monocacy River had large numbers of sites rated as Poor or Very Poor for benthic macroinvertebrates (Table 8-26).

Two MBSS Sentinel sites were located in Frederick County, High Run and Buzzard Branch. Sentinel sites were chosen to provide a representation of the best remaining streams around the state and track natural variations in stream health. Where possible, Sentinel sites are located in watersheds with as much protected land as possible, or in areas projected to become degraded from development at a slower pace. More information about the MBSS Sentinel stream network is found in: 2000-2004 Maryland Biological Stream Survey Volume 11: Sentinel Sites (http: www/dnr/Maryland.gov/streams/pubs/ea05-8_sentinel.pdf).

8.13.2 Physical Habitat

8.13.2.1 Overall Condition

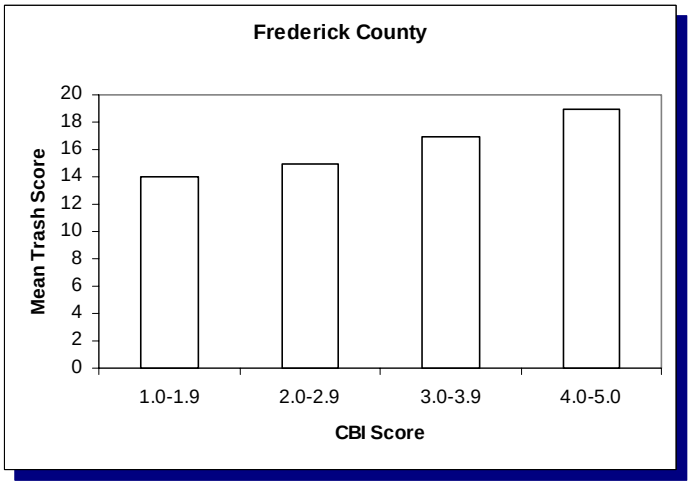
Based on the Physical Habitat Index (PHI), 15% of the streams in Frederick County had Minimally Degraded habitat, and 29% had Degraded or Severely Degraded physical habitat (Figure 8-97). The remaining 56% had Partially Degraded habitat. Surprisingly, there were no obvious geographic trends in habitat condition, except that no sites in the forested areas west of Thurmont were rated as Degraded or Severely Degraded.

8.13.2.2 Trash

Nearly 60% of the stream miles in Frederick County were rated Optimal for trash (Figure 8-98). In contrast, only 11% of streams were rated as being in Marginal condition, and none were rated as being in Poor condition.

TRASH VS. CBI

Trash, or human refuse, is common along roadways and streams in Maryland's urban and urbanizing areas. In Frederick County, there was a moderately strong negative relationship between the amount of trash at a site and its Combined Biotic Index score. Potential reasons for this relationship include illegal dumping and runoff of pollutants from associated impervious areas.



Frederick County Trash vs. CBI score bar graph

Most of the sites with poorer trash ratings were in the general vicinity of the I-15 travel corridor.

8.13.2.3 Channelization

About 15% of the stream miles in Frederick County were channelized (Table 8-4). Rip-rap, culvert pipes, and gabion baskets were the types of documented channelization in the county. Most channelized streams were located in the southern half of the county (Figure 8-99).

8.13.2.4 Inadequate Riparian Buffer

About 11% of the stream miles in Frederick County had no riparian buffers during the 2000-2004 MBSS (Table 8-3). In addition, 10% of stream miles had severe breaks in existing riparian buffers. The central portion of Frederick County contained the largest concentration of sites with inadequate riparian buffer; this was also true for sites with severe buffer breaks such as direct entry of runoff from road crossings, erosion gullies, or areas where livestock had direct access to streams (Figure 8-100). Additional information about buffer breaks, analyzed by county, is provided in: 2000-2004 Maryland Biological Stream Survey Volume 10: Riparian Zone Conditions (http:www/dnr/Maryland.gov/streams/pubs/ea05-7_riparian.pdf).

8.13.2.5 Eroded Banks/Bedload Movement

An estimated 63% of the stream miles in Frederick County had banks rated as Optimal (minimal) for bank erosion (Figure 8-101). In contrast, only 17% of Frederick streams rated as Poor or Marginal for erosion; the remaining 21% were rated in the Suboptimal category. There was a clear geographic trend in bank erosion; sites in the eastern portion of the county were much more likely to have bank erosion problems than sites in the western half of the county.

Over 64% of the stream miles in Frederick County had either minor bar formation or were devoid of bars (Figure 8-101). Nearly 23% had moderate bar formation, and about 12% of streams were rated as having extensive bar formation. The one area of the county which had little development of bars or bank erosion problems was the Catoctin Creek watershed.

8.13.3 Key Nutrients

8.13.3.1 Nitrate-Nitrogen

About 7% of the stream miles in Frederick County had nitrate-Nitrogen levels above 5 mg/l (Figure 8-102). Above this threshold, biological effects are apparent in MBSS data. An additional 63% of stream miles had levels elevated over those found in mostly forested (> 90%) watersheds. Sites with nitrate-Nitrogen levels comparable to background, or forested conditions, were found primarily in the northwestern part of the county.

8.13.3.2 Total Phosphorus

Nearly 51% of the stream miles in Frederick County had spring baseflow levels of total phosphorus within the range of values for forested streams in Maryland (Figure 8-103). Of the remaining stream miles with elevated levels, 20% were above the threshold where biological effects may occur. In general, total phosphorus levels were highest in the southwestern part of the county.

AN IMPORTANT NOTE ON BIODIVERSITY MANAGEMENT

Perhaps the largest ongoing natural resources restoration and protection effort in Maryland is associated with the Chesapeake Bay. In most cases, freshwater biodiversity is not specifically considered during placement and prioritization of Bay restoration and protection projects. In this report and in the more detailed volume in the series on aquatic biodiversity, a system of biodiversity ranking is presented to provide counties and other stewards with a means to plan appropriate protection and restoration activities in locations where they would most benefit stream and river species. Given the historically low level of funding for biodiversity protection and restoration in Maryland and elsewhere, the potential benefit of incorporating freshwater biodiversity needs into other efforts is quite large.

However, it is important to note that although freshwater taxa are the most imperiled group of organisms in Maryland, other groups and individual species not typically found in freshwater habitats are also at high risk and constitute high priority targets for conservation. In addition, freshwater taxa that prefer habitats such as small wetlands may not be well-characterized by the ranking system employed here. To conserve the full array of Maryland's flora and fauna, it is clearly necessary to use other, landscape-based tools and consider factors such as maintaining or reconnecting terrestrial travel corridors.

8.13.4 Stream and River Biodiversity

To provide a means to prioritize stream systems for biodiversity protection and restoration within each county and on a statewide basis, a tiered watershed and stream reach prioritization method was developed. Special emphasis was placed on state-listed species, stronghold watersheds for state-listed species, and stream reaches with one or more state-listed aquatic fauna. Fauna considered included stream salamanders, freshwater fishes, and freshwater mussels. Rare, pollution-sensitive benthic macroinvertebrates collected during the 1994-2004 MBSS were also used to

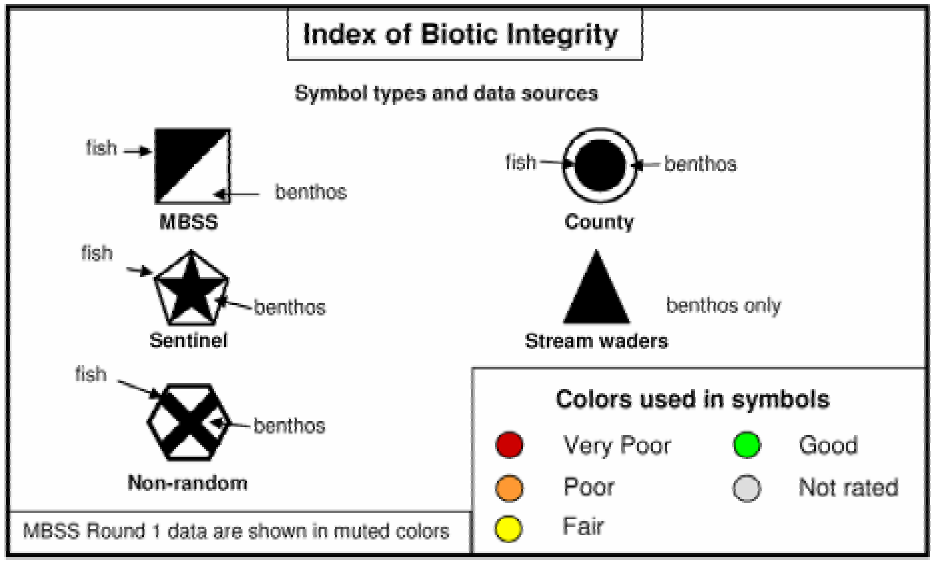
identify the suite of watersheds necessary to conserve the full array of known stream and river biota in Maryland. A complete description of the biodiversity ranking process is found in: 2000-2004 Maryland Biological Stream Survey Volume 9: Stream and Riverine Biodiversity (http:www/dnr/Maryland.gov/streams/pubs/ea05-6_ biodiv.pdf).

Of the five watersheds found in Frederick County, the Upper Monocacy River was classified as Tier 1, meaning that this watershed serves as a stronghold for one or more state listed aquatic species (Figure 8-104). In contrast, the Catoctin Creek watershed was the lowest ranking for stream and river biodiversity in the county and in Maryland. Any reaches that had either state-listed or GCN species, or high intactness values were highlighted to facilitate additional emphasis in planning restoration and protection activities.

8.13.5 Stressors

At 92% of stream miles, the most extensive stressor characterized by the MBSS in Frederick County during the 2000-2004 MBSS was non-native terrestrial plants in the riparian zone (Figure 8-5). Other stressors found were: streams with non-native aquatic fauna (present in 54% of stream miles); eroded banks (19% of stream miles); streams with > 5% urban land use upstream (13% of stream miles); and streams with no riparian buffer zone (11% of stream miles). Several other stressors affected 5% or more of the stream miles in the county. These included areas with high nitrate-Nitrogen and acid deposition.

Key to MBSS 2000-2004 County Maps



Tier 1: Stronghold watershed (most robust remaining population) for one or more state-listed fish, aquatic herpetofauna, or freshwater mussels.

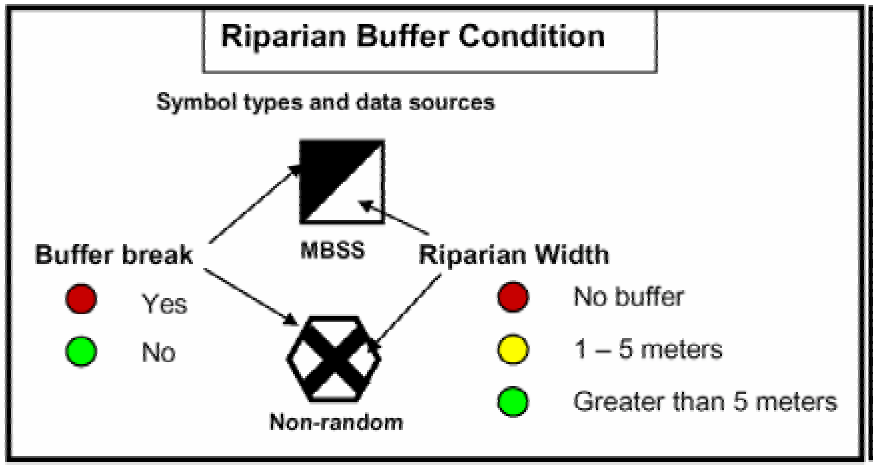
Tier 2: Stronghold watershed for one or more non-state listed species of greatest conservation need (GCN) fish, aquatic herpetofauna, or freshwater mussels, that also had state-listed fish, aquatic herpetofauna, or freshwater mussels present.

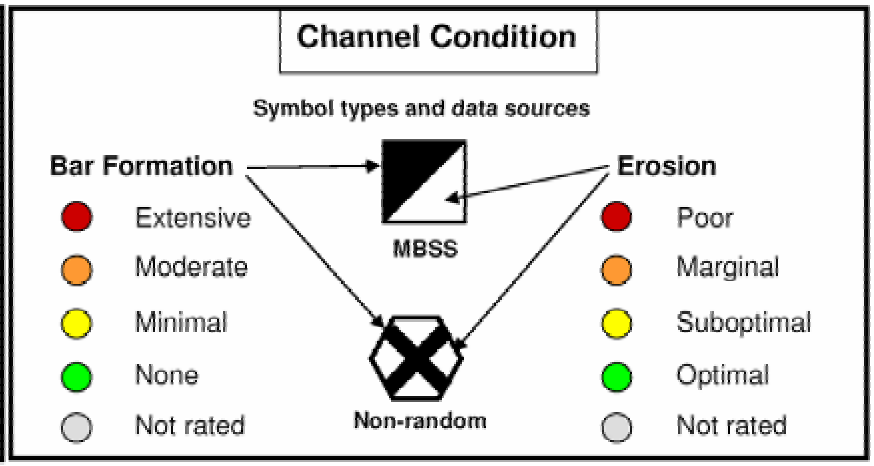
Tier 3: Stronghold watershed for one or more non-state listed GCN fish, aquatic herpetofauna, or freshwater mussels, no state-listed fish, aquatic herpetofauna, or freshwater mussels present.

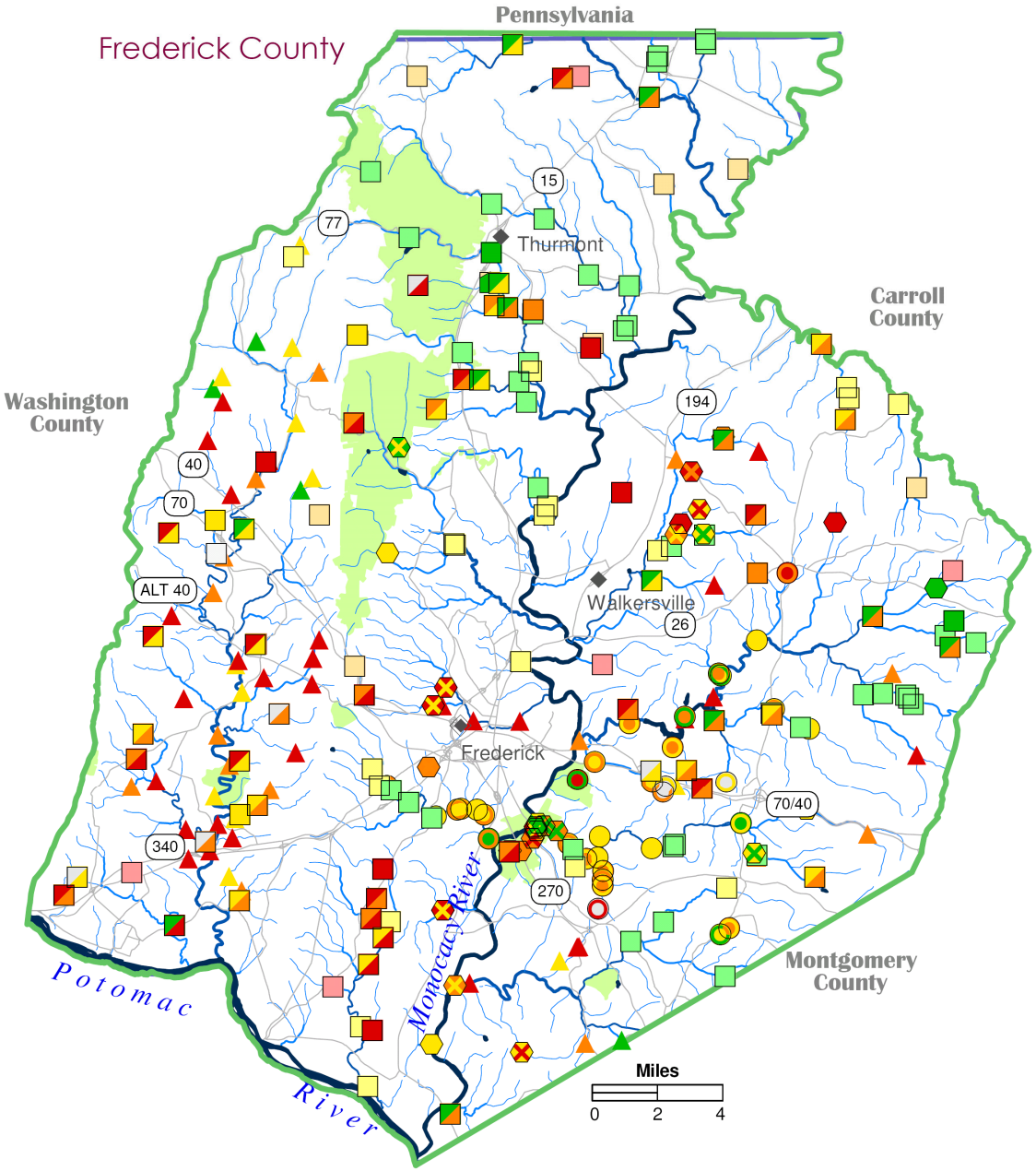
Tier 4: Non-stronghold watershed with one or more state-listed fish, aquatic herpetofauna, or freshwater mussels present.

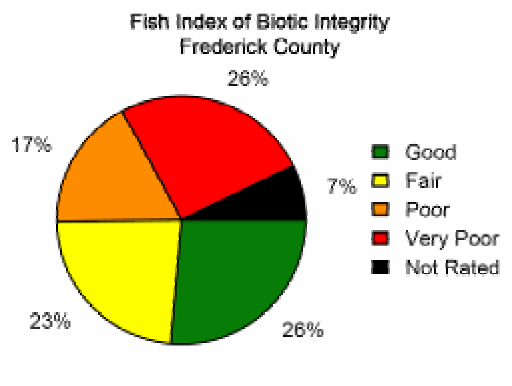
Tier 5: Not of the above, but a biodiversity conservation watershed. In other words, part of the network of watersheds that must be conserved to keep all native fishes, aquatic herpetofauna, freshwater mussels, and rare, pollution sensitive benthic macroinvertebrates extant in Maryland.

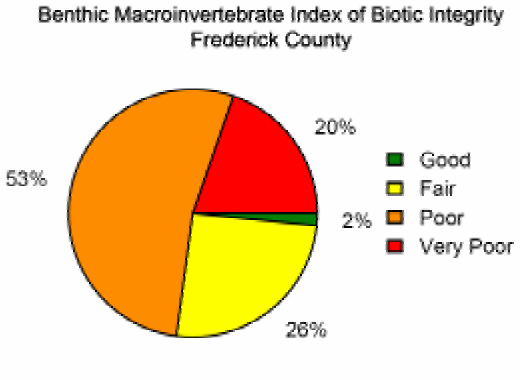
Tier 6: Not of the above.











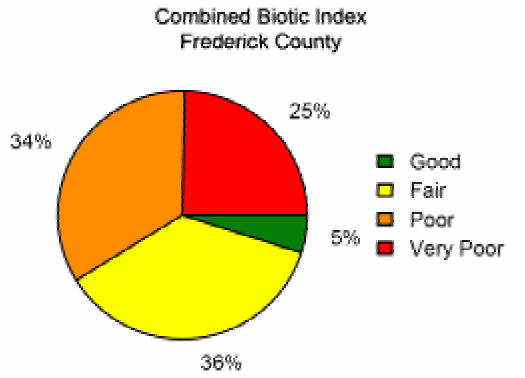


Figure 8-96. Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI) pie charts and map of stream health for Frederick County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie charts represent 2000-2004 data only, Combined Biotic Index pie chart represents mean of FIBI and BIBI)

Table 8-25. MBSS sites sampled in Frederick County during 1994- 2004, ranked by Combined Biotic Index Score (CBI)

Frederick County - MBSS Sites

SITE NUMBER	STREAM NAME	WATERSHED	CBI
Best (in order of CBI score)			
UMON-288-S-2003	High Run	Monocacy River Upper	4.50
FR-P-156-231-96	South Fork Linganore Creek	Monocacy River Lower	4.38
UMON-288-S-2001	High Run	Monocacy River Upper	4.38
LMON-119-T-2000	Talbot Branch UT1	Monocacy River Lower	4.29
UMON-230-R-2000	Hunting Creek	Monocacy River Upper	4.29
UMON-288-S-2000	High Run	Monocacy River Upper	4.25
UMON-288-S-2002	High Run	Monocacy River Upper	4.25
UMON-221-R-2000	Hunting Creek	Monocacy River Upper	4.21
FR-P-132-320-96	Little Hunting Creek	Monocacy River Upper	4.21
FR-P-411-305-96	Bens Branch	Monocacy River Lower	4.13
UMON-288-S-2004	High Run	Monocacy River Upper	4.13
UMON-304-R-2000	Friends Creek	Monocacy River Upper	4.08
FR-P-156-234-96	South Fork Linganore Creek	Monocacy River Lower	4.00
LMON-209-T-2000	Weldon Creek	Monocacy River Lower	4.00
UMON-119-S-2002	Buzzard Branch	Monocacy River Upper	4.00
FR-P-156-252-96	South Fork Linganore Creek	Monocacy River Lower	3.88
UMON-101-C-2001	Little Hunting Creek	Monocacy River Upper	3.88
MONY-301-N-2004	Bush Creek	Monocacy River Lower	3.83
LMON-252-T-2000	Church Run	Monocacy River Lower	3.79
LMON-220-R-2003	Israel Creek UT1	Monocacy River Lower	3.79
LMON-210-T-2000	Cabbage Run	Monocacy River Lower	3.75
UMON-413-R-2000	Toms Creek	Monocacy River Upper	3.75
FR-B-133-222-96	Owens Creek	Monocacy River Upper	3.71
LMON-337-R-2003	Bens Branch	Monocacy River Lower	3.71
FR-P-258-215-96	Fishing Creek	Monocacy River Upper	3.71

SITE NUMBER	STREAM NAME	WATERSHED	CBI
Worst (most degraded sites first)			
CATO-125-R-2003	West Branch (MP) UT1	Catoctin Creek	1.13
LMON-147-T-2000	Dollyhide Creek UT1	Monocacy River Lower	1.25
FR-B-076-118-96	Little Catoctin Creek UT	Potomac River	1.25
PRFR-101-R-2004	Tuscarora Creek UT1	Potomac River	1.25
FR-P-290-121-96	Tuscarora Creek UT	Potomac River	1.38
UMON-106-R-2000	Glade Creek	Monocacy River Upper	1.38
LMON-106-T-2000	Laurel Branch	Monocacy River Lower	1.42
FR-P-399-126-96	Weldon Creek UT	Monocacy River Lower	1.42
FR-B-065-111-96	Catoctin Creek UT	Catoctin Creek	1.50
MONY-103-N-2004	Monocacy River UT1 UT1	Monocacy River Lower	1.50
UMON-128-R-2000	High Run	Monocacy River Upper	1.50
UMON-101-R-2000	Little Hunting Creek UT1 UT1	Monocacy River Upper	1.50
UMON-131-R-2000	Creagers Branch	Monocacy River Upper	1.54
UMON-132-R-2000	Steep Creek UT1	Monocacy River Upper	1.63
LMON-114-R-2003	Bush Creek UT2	Monocacy River Lower	1.67
FR-P-371-132-96	Motter's Run	Monocacy River Upper	1.67
PRFR-115-R-2004	Tuscarora Creek	Potomac River	1.71
FR-B-085-212-96	Catoctin Creek	Catoctin Creek	1.75
LMON-142-R-2003	Linganore Lake UT	Monocacy River Lower	1.75
LMON-136-R-2003	Rock Creek (MP)	Monocacy River Lower	1.75
FR-P-005-141-96	Carroll Creek UT	Monocacy River Lower	1.75
FR-P-300-130-96	Monocacy River UT	Monocacy River Upper	1.75
PRFR-206-R-2004	Tuscarora Creek UT3	Potomac River	1.79
CATO-103-R-2003	Manor Run	Catoctin Creek	1.88
FR-P-462-346-96	Clemson Branch	Double Pipe Creek	1.88

Table 8-26. Stream Waders sites sampled in Frederick County during 2000-2004, ranked by Family-level Benthic Index of Biotic Integrity

Frederick County - Stream Wader Sites				
WATERSHED	# GOOD	# FAIR	# POOR	# VERY POOR
Catoctin Creek	3	10	9	19
Double Pipe Creek	0	3	1	3
Monocacy River Lower	0	2	7	10
Monocacy River Upper	12	31	10	18

Beginning in 1999, Frederick County started collecting stream health data at targeted sites in four high-priority watersheds (Lower Bush, Ballenger, Linganore, and Bennett Creeks). Monitoring is also conducted at targeted sites for the County's NPDES Stormwater Permit, at potential restoration sites to characterize pre-restoration conditions, and at sites necessary to characterize watersheds in the county in support of watershed management activities. Between 15 and 20 sites per year are sampled during the spring and summer field seasons. MBSS protocols are followed for fish sampling and benthic macroinvertebrate sampling methodologies (Kazyak 2001). MBSS habitat and *in-situ* water quality data are collected, but nutrient data are not collected. Additionally, stream geomorphology data are collected at the county's monitoring sites, including representative cross section measurements, pebble counts, and bank erosion pins. Frederick County's monitoring plan is summarized by Southerland et al. (1999).

Because Frederick County's sampling scheme is not random, their data are not integrated into MBSS estimates. However, the targeted sampling data they do collect are useful in helping fill gaps in MBSS coverage.

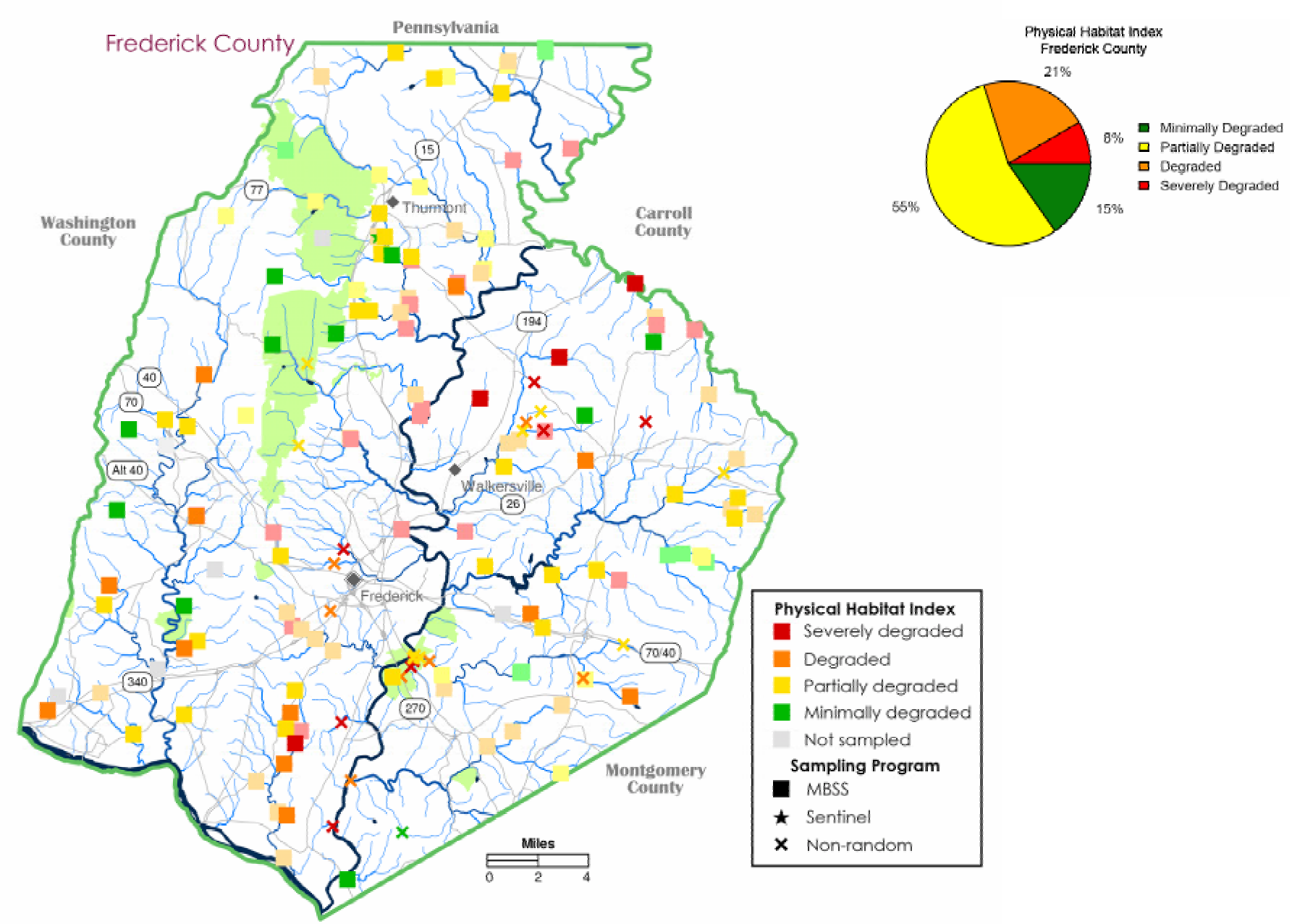


Figure 8-97. Physical Habitat Index (PHI) pie chart and map of stream habitat quality for Frederick County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

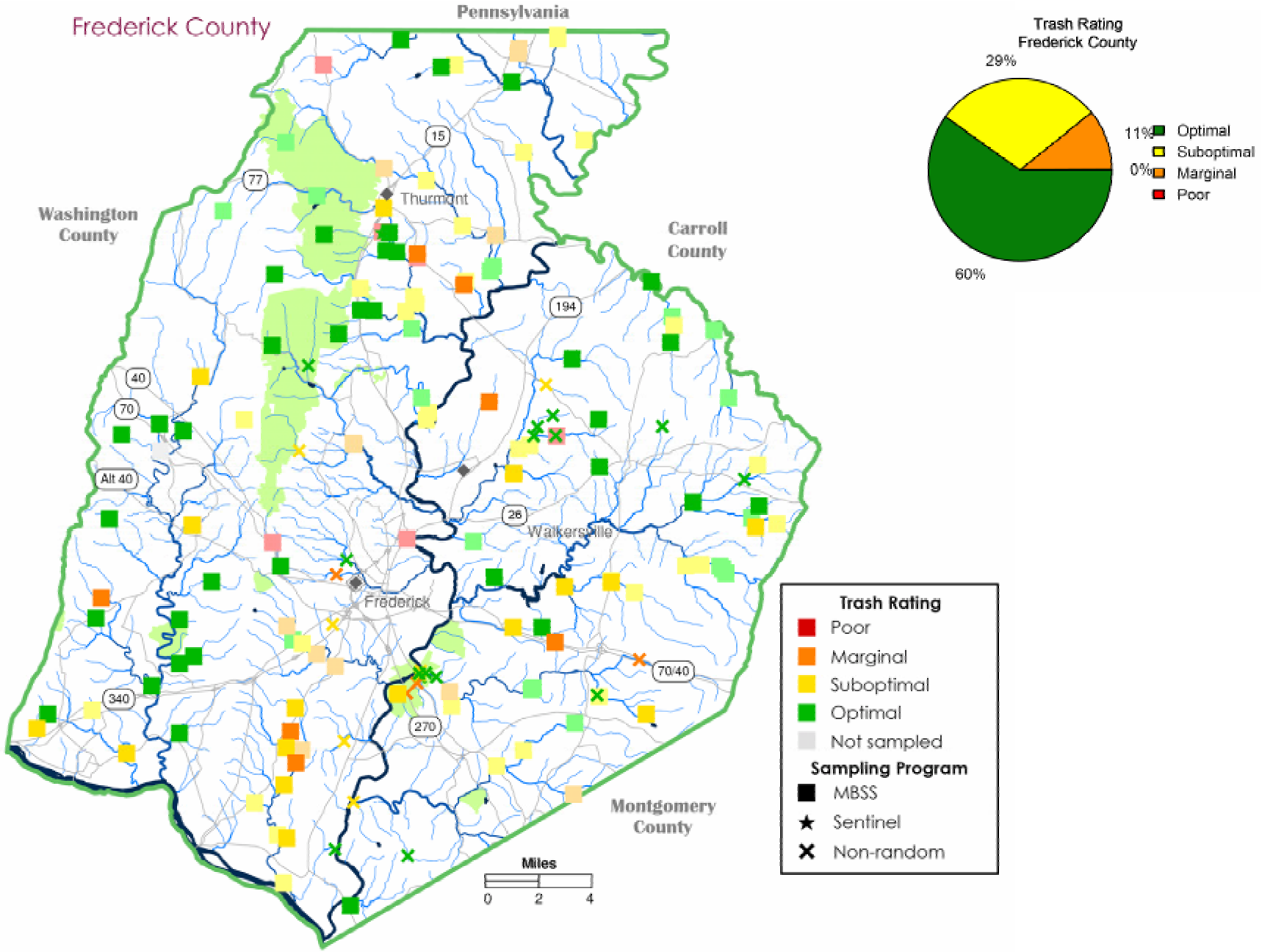


Figure 8-98. Pie chart and map of trash rating (0-20 scale) for Frederick County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

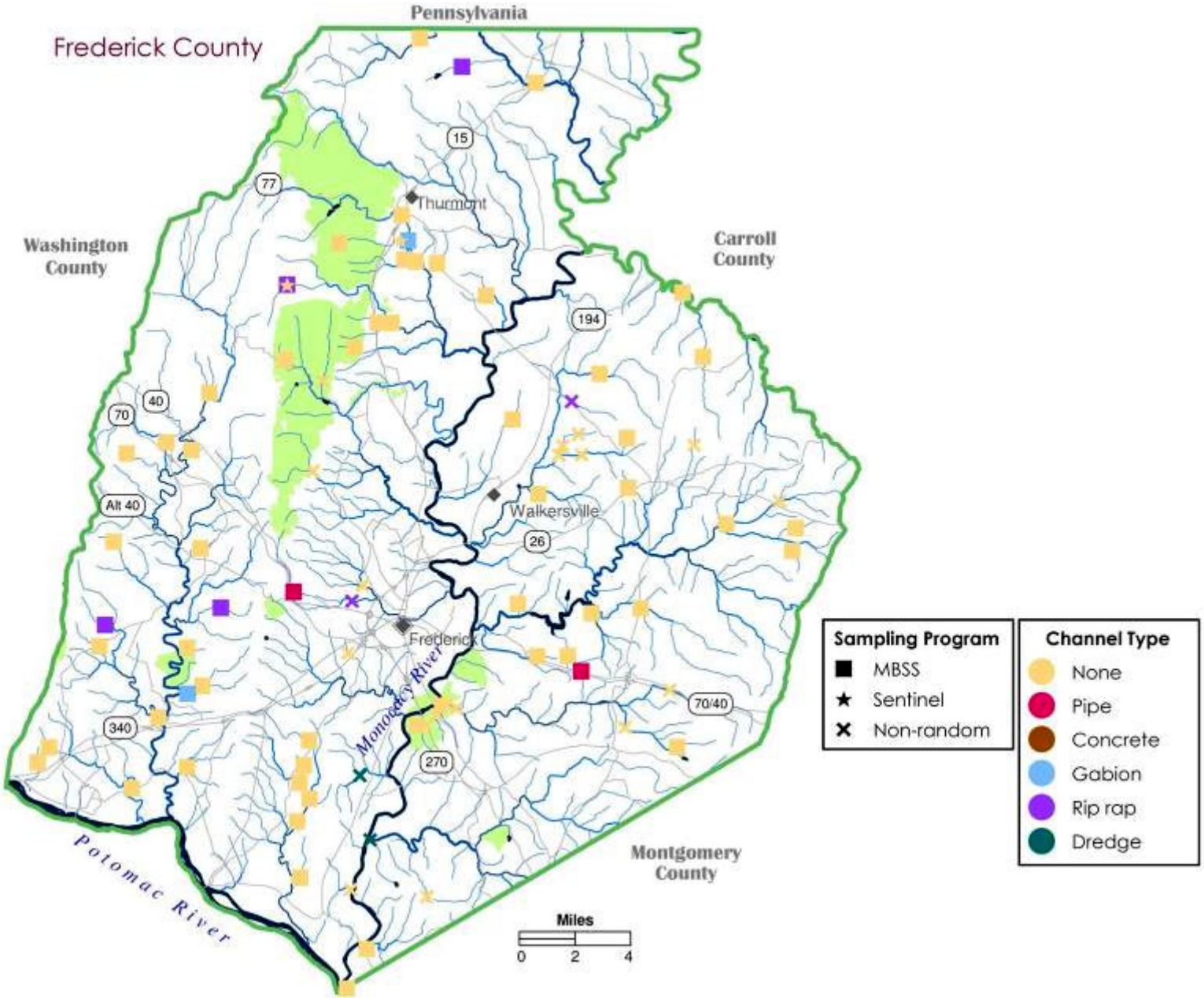


Figure 8-99. Map of channelized sites, by type, for Frederick County streams sampled by the MBSS during 2000-2004. *NOTE: When channelization is indicated, it does not necessarily mean that the entire 75m segment was affected.*

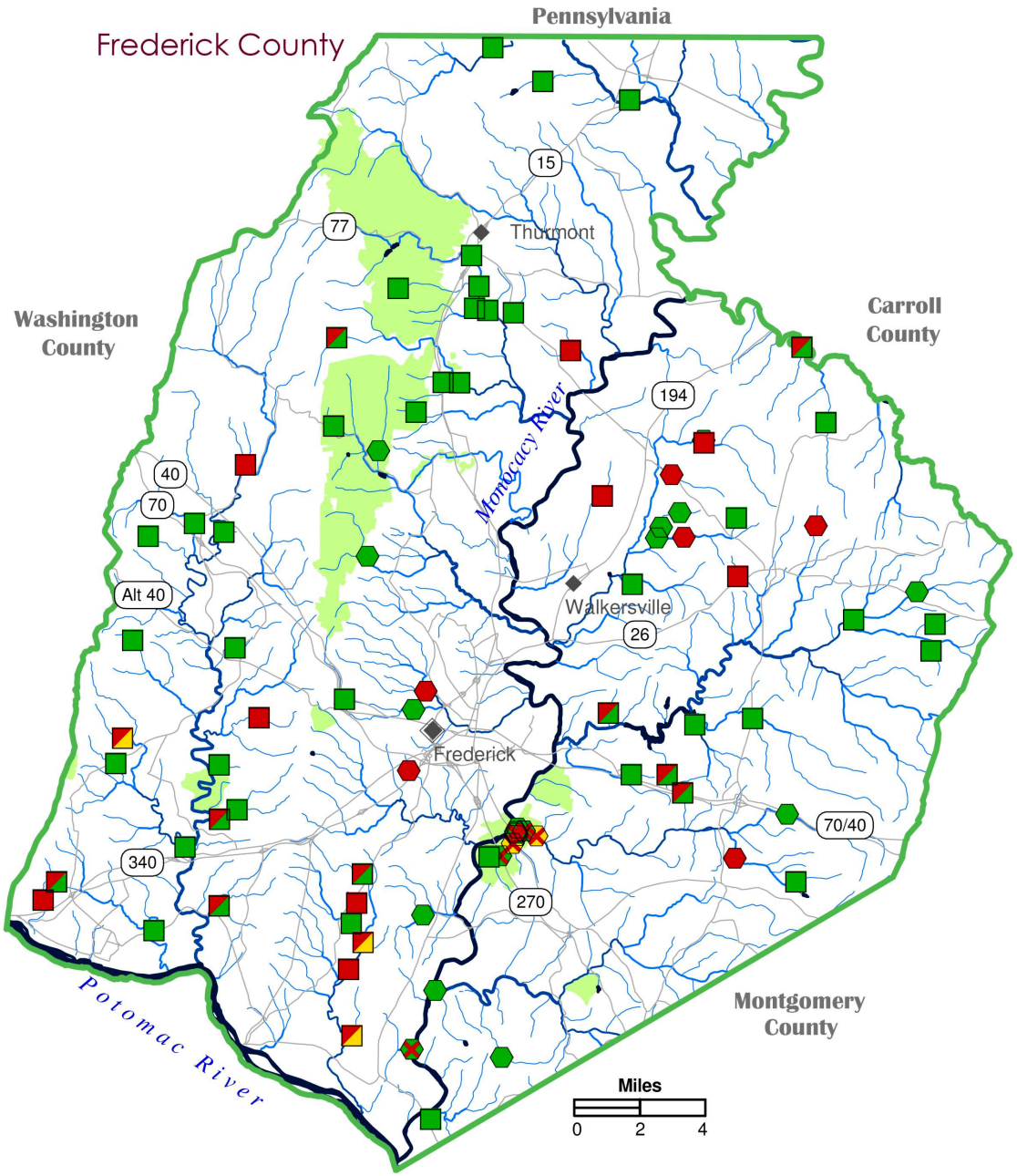
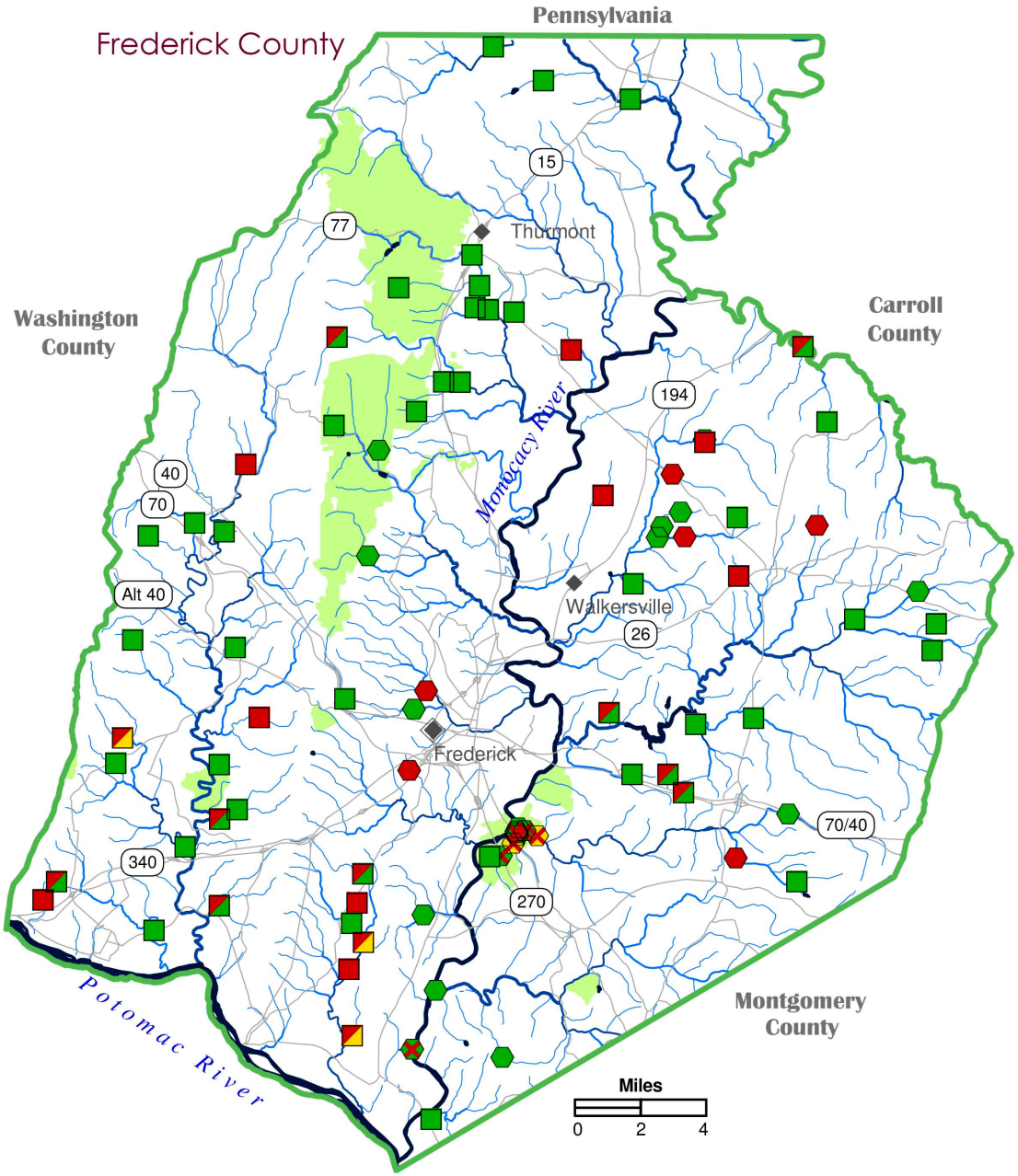
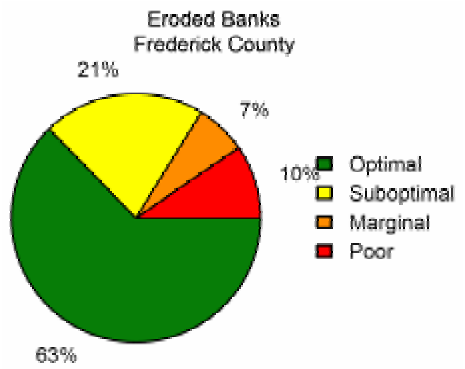


Figure 8-100. Map of sites with inadequate riparian buffers and buffer breaks for Frederick County streams sampled by the MBSS during 2000-2004. *NOTE: Multiple riparian buffer breaks sometimes occurred at a site; only the most severe was depicted*





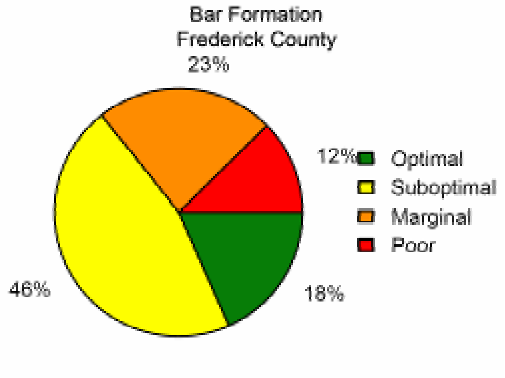


Figure 8-101. Pie charts and map of sites with eroded banks and instream bar formation for Frederick County streams sampled by the MBSS during 2000-2004

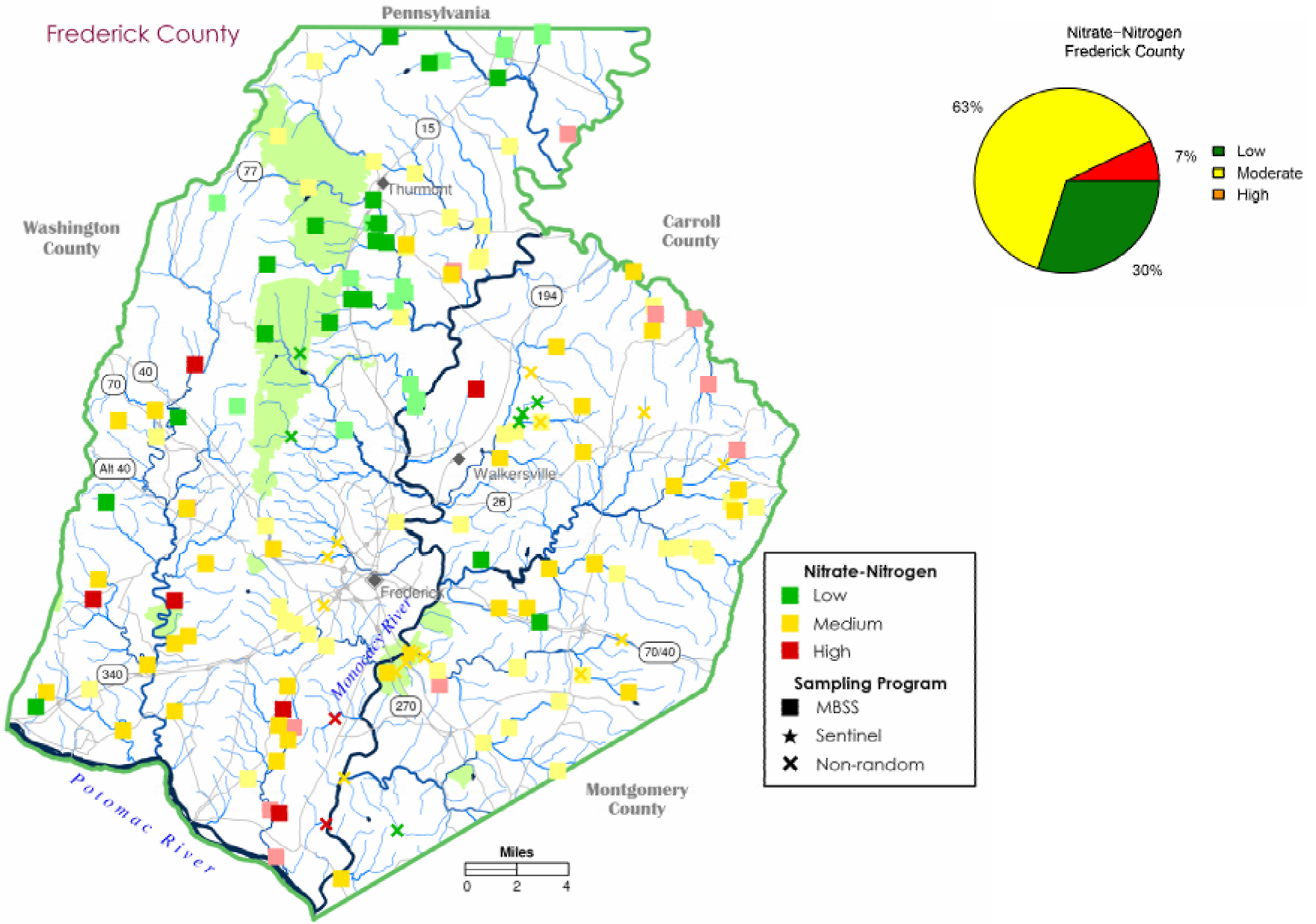


Figure 8-102. Pie chart and map of nitrate-nitrogen values (mg/l) for Frederick County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only) (Low = 1.0, Medium = 1.0 – 5.0, High = > 5.0).

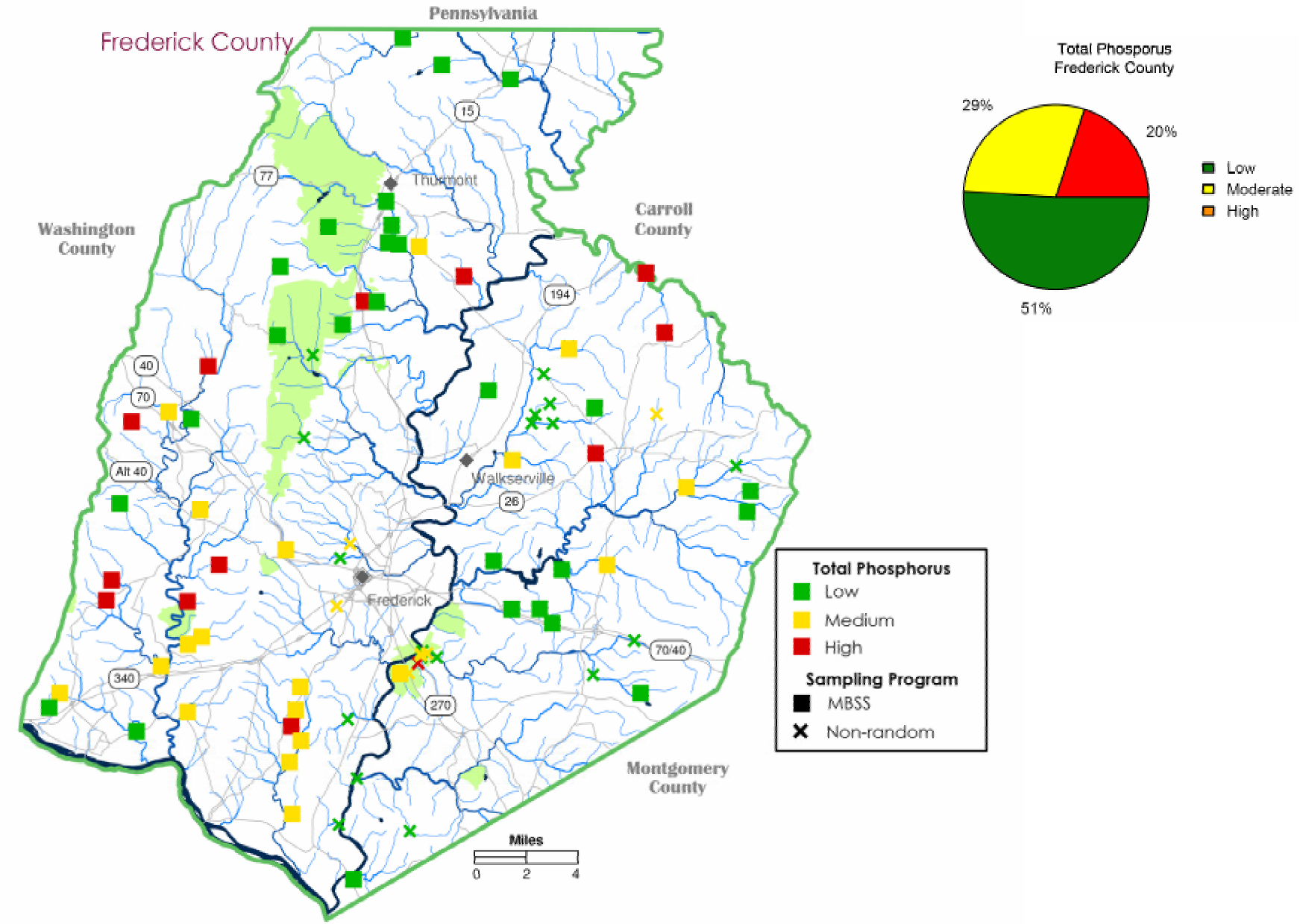


Figure 8-103. Pie chart and map of total phosphorus values (mg/l) for Frederick County streams sampled by the MBSS during 2000-2004 (Low = < 0.025, Medium = 0.025 – 0.07, High = > 0.07)

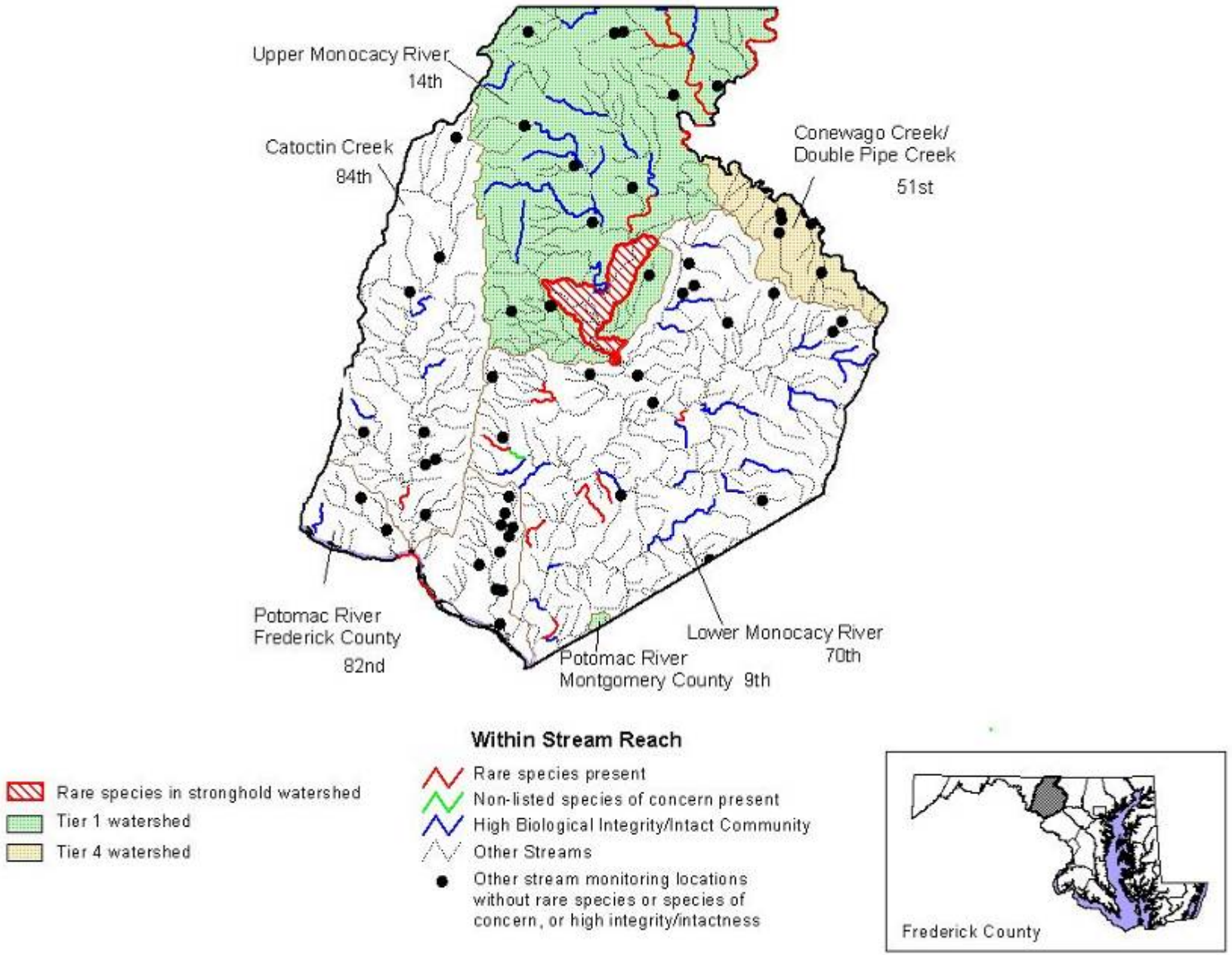


Figure 8-104. Aquatic Heritage Biodiversity Ranking map for Frederick County, by watershed. Data from MBSS 1994-2004, MBSS qualitative data, Raesly, unpub. data, Harris 1975, Thompson 1984, and DNR Natural Heritage Program database.